

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

PMT0204 – FUNDAMENTAL MATHEMATICS II
(All sections / Groups)

30 May 2019
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of THREE (3) printed pages with 4 questions only.
2. Answer all FOUR (4) questions.
3. Write all your answers in the answer booklet provided.
4. Only NON-PROGRAMMABLE calculators are allowed.

Question 1 (25 Marks)

a) If $A = \begin{bmatrix} 1 & -2 \\ 4 & 1 \end{bmatrix}$ $B = \begin{bmatrix} a & 2 \\ b & 1 \end{bmatrix}$ find the values of a and b such that $\mathbf{AB} = \mathbf{BA}$.
(6 marks)

b) Find $\begin{pmatrix} 1 & 0 & 2 \\ -3 & 2 & 0 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 2 & 1 \\ 5 & 5 \end{pmatrix}$
(3 marks)

c) Given the determinant $\begin{vmatrix} -3 & 1 & 2 \\ 2 & x+1 & 2 \\ 2 & 1 & x+2 \end{vmatrix} = 0$, find the value(s) of x .
(6 marks)

d) Solve the following system of equation using the Cramer's rule.

$$\begin{aligned} 2x + y + z &= 1 \\ x - 2y - 3z &= 1 \\ 3x + 2y + 4z &= 5 \end{aligned}$$

(10 marks)

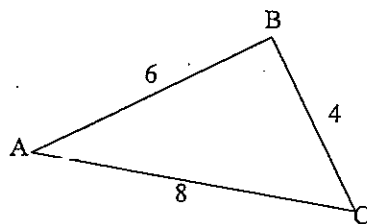
Question 2 (25 Marks)

a) If $\cos \theta = \frac{2}{3}$ find $\cot \theta$.
(4 marks)

b) Graph the sinusoidal function $y = 2\cos\left(\frac{\pi}{2}x + \pi\right) + 1$. State the amplitude, period and phase shift.
(7 marks)

c) Solve the equation $2\sin^2\theta + 7\cos\theta - 5 = 0$ for $0 \leq \theta \leq 2\pi$.
(9 marks)

d) In the triangle shown below, find the measure of angle A .
(5 marks)



Continued...

Question 3 (25 Marks)

a) Evaluate

i. $\lim_{x \rightarrow 0} \left(\frac{3x^2 + x - 2}{2x^3 + 5x + 3} \right)$ (2 marks)

ii. $\lim_{x \rightarrow \infty} \left(\frac{2x^2 + 1}{5x + 2x^2} \right)$ (3 marks)

b) Find the derivative of the following functions:

i. $y = x^3 e^{2x}$ (5 marks)

ii. $y = \ln(x - x^5)$ (6 marks)

c) Given $f(x) = x^4 - 4x^3 + 10$, find where the graph of f is increasing, decreasing, concave up and concave down.

(9 marks)

Question 4 (25 Marks)

a) Integrate $\int \left(2e^{2x} + \frac{1}{x+5} - 4x \right) dx$. (5 marks)

b) Evaluate $\int_0^1 \left(\frac{x+2}{x^2-1} \right) dx$ by using partial derivative technique. (10 marks)

c) Calculate the area of the region enclosed by the line $y = x + 1$ and the curve $y = x^2 - 2x + 1$. Sketch the area of the graph and show the intersection points.

(10 marks)

End of Page

FORMULA**A. Trigonometric Identities****Pythagorean Identities**

$$\cos^2 A + \sin^2 A = 1 \quad \sec^2 A = 1 + \tan^2 A \quad \csc^2 A = 1 + \cot^2 A$$

$$\begin{array}{ll} \text{Law of sines} & \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c} \\ \text{Law of cosines} & \begin{aligned} a^2 &= b^2 + c^2 - 2bc \cos A \\ b^2 &= a^2 + c^2 - 2ac \cos B \\ c^2 &= a^2 + b^2 - 2ab \cos C \end{aligned} \end{array}$$

B. Differentiation Rules**Product-to-Sum Formulas**

$$\frac{d}{dx}[x^n] = nx^{n-1}; n \text{ is any real number}$$

$$\frac{d}{dx}[f(x) \cdot g(x)] = f(x)g'(x) + f'(x)g(x) \quad ; \text{ The Product Rule}$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2} \quad ; \text{ The Quotient Rule}$$

$$\frac{d}{dx}f(g(x)) = f'(g(x)) \cdot g'(x) \quad ; \text{ The Chain Rule}$$

$$\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1} \cdot g'(x) \quad ; \text{ The power rule combined with the chain rule}$$

$$\frac{d}{dx}[\sin x] = \cos x$$

$$\frac{d}{dx}[\cos x] = -\sin x$$

$$\frac{d}{dx}[\tan x] = \sec^2 x$$

$$\frac{d}{dx}[\sec x] = \sec x \tan x$$

$$\frac{d}{dx}[\cot x] = -\csc^2 x$$

$$\frac{d}{dx}[\csc x] = -\csc x \cot x$$

$$\frac{d}{dx}[e^x] = e^x$$

$$\frac{d}{dx}[\ln x] = \frac{1}{x}; \quad x > 0$$

C. Basic Integration Formulas

$$\int cf(x) dx = c \int f(x) dx$$

$$\int k dx = kx + C$$

$$\int [f(x) \pm g(x)] dx = \int f(x) dx \pm \int g(x) dx$$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \neq -1$$

$$\int e^x dx = e^x + C$$

$$\int \frac{1}{x} dx = \ln|x| + C$$

$$\text{Integration by-parts: } \int u dv = uv - \int v du$$

$$\text{Volume (disk)} = \pi \int_a^b (f(x))^2 dx$$

$$\text{Area} = \int_a^b (f(x) - g(x)) dx$$

$$\text{Volume (washer)} = \pi \int_a^b [(f(x))^2 - (g(x))^2] dx$$